

PATENT

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Apparatus for and Method of Sealing a Lead Exit on a Motor

Background of the Invention

(i) Field of the Invention

The present invention relates in general to a gasket, and particularly to a gasket that is used between an electric motor and a conduit box attached to the electric motor. The gasket provides a liquid tight seal between the electric motor and the conduit box. The gasket also provides a liquid tight seal between motor leads that extend from the electric motor and go into the conduit box and the gasket. Additionally, the gasket allows the conduit box to be detached from the electric motor and rotated to an alternate orientation relative to the electric motor and reattached to the electric motor in the alternate orientation without breaking the liquid tight seal between the motor leads and the gasket.

(ii) Description of the Related Art

Prior art gaskets used to form a liquid tight seal between an electric motor and a conduit box are well known in the art. These gaskets are typically used on electric motors used in food, beverage, or chemical processing plants where the electric motor is constantly exposed to high pressure washdowns or other high humidity or wet environments. These electric motors have a lead opening through which motor leads extend. The conduit box also has a lead opening. The conduit box is adapted to be attached to the electric motor with the conduit box lead opening aligned with the electric motor lead opening so that the motor leads can extend from the electric motor and into the conduit box through the electric motor lead opening and the conduit box lead opening. In the conduit box the motor leads are connected to a power source.

Typical prior art gaskets are made of a flexible and resilient material such as rubber or the like. These gaskets come in a variety of shapes and have opposite first and second surfaces that are generally flat. The gaskets are designed to be placed between the electric motor and the conduit box attached to the electric motor. The gaskets surround the lead opening on the electric motor and the lead opening on the conduit box. The gaskets also have a lead opening that allows the motor leads to pass through the gasket and into the conduit box. When the conduit box is attached to the electric motor the gasket is compressed between the two and forms a liquid tight seal between the electric motor and the conduit box. The compressed gasket prevents liquids from the exterior of the conduit box and the electric motor from entering the conduit box through the conduit box lead opening and from entering the electric motor through the electric motor lead opening.

The gaskets, however, do not prevent liquids from passing from an interior of the conduit box through the conduit box lead opening, through the gasket lead opening, through the electric motor lead opening and into the electric motor. To solve this shortcoming, a silicone sealant is applied to the gasket lead opening after the conduit box is attached to the electric motor. The sealant fills the gasket lead opening and surrounds the motor leads. The

sealant also contacts and adheres to the electric motor lead opening and the conduit box lead opening. After curing for approximately 24 hours, the gasket in conjunction with the sealant provides a liquid tight seal between the interior of the conduit box and the electric motor. Because the sealant is in contact with and adheres to the conduit box lead opening and the electric motor lead opening, the conduit box can not be removed from the electric motor without breaking the seal formed by the sealant. When the seal formed by the sealant is broken, the sealant must be reapplied and allowed to cure for another 24 hours before the electric motor can be put into service.

10 The electric motors are generally cylindrical in shape and the conduit boxes have bottom surfaces that are concave and complementary to the cylindrical electric motors. Because of the concave bottom surface of the conduit boxes, the conduit boxes can be attached to the electric motors in one of two different orientations. The two orientations are 180 degrees apart.

15 The conduit boxes have a power source opening for running a power source to the interior of the conduit box. The power source is connected to the motor leads in the conduit box interior. The power source opening is typically in a side wall of the conduit box. Because the conduit box is attached to the electric motor in one of two orientations, the power source opening will also

20 be in one of two orientations.

 In the typical application of the electric motors, the power source that is to be connected to the motor leads is in a fixed position and the orientation of the conduit box power source opening must coincide with the fixed position of the power source. If the orientation of the conduit box power source opening is incorrect, the conduit box must be removed from the electric motor and reattached to the electric motor in the correct orientation. Prior art electric motors with attached and sealed conduit boxes are disadvantaged in this respect because the removal of the conduit box from the electric motor breaks the seal formed by the sealant and requires the sealant to be reapplied and

25 allowed to cure for 24 hours before the electric motor can be placed in

30 service.

What is needed to overcome this disadvantage of electric motors with attached and sealed conduit boxes is an electric motor that has a gasket that allows the conduit box to be removed from the electric motor and reattached in a different orientation without breaking the seal formed by the sealant so
5 that the electric motor does not need a 24 hour curing period before placing the electric motor in service.

Summary of the Invention

The present invention overcomes shortcomings of prior art gaskets by providing a gasket that is configured and adapted to allow the conduit box to
10 be removed from the electric motor and reattached to the electric motor in a different orientation without breaking the seal formed by the sealant and requiring the reapplication of a sealant and the resulting 24 hour curing period.

The gasket of the invention is configured and adapted to be positioned
15 between an electric motor and a conduit box attached to the electric motor. The gasket forms a liquid tight seal between the conduit box and the electric motor. The gasket has opposite first and second surfaces and a lead opening that passes through the gasket. The gasket lead opening allows motor leads to pass through the gasket and enter the conduit box through a conduit box
20 lead opening. The gasket first surface has a wall that projects outwardly from the gasket first surface and surrounds the gasket lead opening. The wall defines a cavity within the wall that is adjacent the gasket lead opening. A sealant, preferably an epoxy sealant although other sealants may also be used, is positioned in the cavity. The sealant seals closed the gasket lead
25 opening and seals around the motor leads that pass through the gasket lead opening. The gasket and sealant thereby prevent any liquids in the conduit box from entering the electric motor through the gasket lead opening.

The gasket is preferably constructed of a resilient material. The resilient material allows the gasket lead opening to be dimensioned so that
30 the gasket lead opening is stretched open to allow the motor leads to pass through the gasket lead opening. The gasket lead opening thereby holds the motor leads tightly together.

The gasket is positioned on the electric motor so that the gasket second surface is in contact with the electric motor and the gasket first surface is in contact with the conduit box. The gasket wall has a periphery that is dimensioned so that the gasket wall can be inserted into the conduit box lead opening without being constrained by the conduit box lead opening. The gasket wall periphery may be further dimensioned so that the gasket wall does not contact the conduit box lead opening. Alternatively or additionally, the gasket wall may be dimensioned so that the gasket wall projects outwardly from the gasket first surface a distance that enables the gasket wall to pass completely through the conduit box lead opening. Preferably, the conduit box lead opening is an annular lead opening and the gasket wall is an annular wall although this is not required.

Preferably, the sealant is positioned primarily within the cavity defined by the gasket wall. The gasket wall limits the sealant from contacting the conduit box. Because the sealant does not contact the conduit box, the conduit box can be removed from the electric motor and reattached to the electric motor in a different orientation without breaking the seal formed by the sealant within the gasket cavity. Preferably, the gasket lead opening is dimensioned so that the gasket lead opening and the motor leads passing through the gasket lead opening limit the sealant from flowing through the gasket lead opening and coming in contact with the electric motor.

In use, the gasket is positioned on an electric motor with the motor leads passing through the gasket lead opening and with the gasket second surface in contact with the electric motor. A conduit box is positioned on the electric motor on top of the gasket with the conduit box lead opening aligned with the gasket lead opening and the motor leads passing through the conduit box lead opening and into an interior of the conduit box. The conduit box is positioned against the gasket first surface so that the gasket wall projects into the conduit box lead opening. The conduit box is then attached to the motor by threaded fasteners. The gasket cavity is then filled with a sealant and the wall limits the sealant from contacting and adhering to the conduit box. The sealant is then allowed to cure and forms a liquid tight seal and seals closed

the gasket lead opening. The conduit box may be removed from the electric motor and rotated 180 degrees without breaking the seal formed in the cavity by the sealant. The conduit box may then be reattached to the electric motor in the desired orientation.

5 Brief Description of Drawings

Further objectives and features of the present invention are set forth in the following detailed description of the preferred embodiment of the invention and in the drawing figures wherein:

Figure 1 is a perspective view an electric motor with a conduit box
10 attached to a side of the electric motor;

Figure 2 is a top plan view of a conduit box attached to an electric motor with the cover plate of the conduit box removed;

Figure 3 is a cross sectional view of the conduit box of figure 2 along line 2-2;

15 Figure 4 is an exploded view showing the assembly of the electric motor, the gasket, and the conduit box;

Figure 5 is a top plan view of the gasket; and

Figure 6 is a cross sectional view of the gasket of figure 5 along line 6-6.

20 Detailed Description of the Invention

Figure 1 shows an electric motor 20 having an outer motor shell 22. The motor shell 22 is shown as being generally cylindrical, however, it should be understood that not all motor shells 22 are cylindrical and the shape of the motor shell 22 does not alter the operation of the invention. A conduit box 24
25 is attached to the motor shell 22. The electric motor 20 has a shaft end 26 and an opposite back end 28. A shaft 30 projects outwardly from the electric motor 20 on the motor shaft end 26. The electric motor 20, as can be seen in figure 3, has motor leads 32 which extend through the motor shell 22 by passing through a motor shell lead opening 34. The motor leads 32 are to be
30 attached to a power source (not shown) in the conduit box 24.

The conduit box 24 has a bottom wall 36, a side wall 38, and a cover plate 40. The conduit box bottom wall 36 and the side wall 38 define an

interior 42 of the conduit box 24. The cover plate 40 is selectively removable from the conduit box 24 to allow access to the conduit box interior 42. The conduit box bottom wall 36 has a lead opening 44 to allow the motor leads 32 to pass through the conduit box bottom wall 36 and into the conduit box interior 42. The conduit box lead opening 44 is aligned with the motor shell lead opening 34 when the conduit box 24 is attached to the motor shell 22. Arranged around the box lead opening 44 are a plurality of fastener holes 45 that align with fastener holes (not shown) in the motor shell 22. Threaded fasteners, for example nut and bolt fasteners (not shown) are inserted through the aligned fastener holes of the conduit box and motor shell in attaching the box to the shell.

The conduit box side wall 38 has a power source opening 46 to allow power source or control source leads (not shown) to pass through the conduit box side wall 38 and into the conduit box interior 42 where they are connected to the motor leads 32. The conduit box power source opening 46 is shown as being oriented toward the shaft end 26 of the electric motor 20. However, as will be discussed below, the conduit box 24 may be attached to the motor shell 22 so that the conduit box power source opening 46 has a different orientation relative to the electric motor 20. Preferably, at least a portion 48 of the conduit box bottom wall 36 is concave and complementary to the generally cylindrical shape of the motor shell 22. However, it should be understood that the conduit box bottom wall 36 does not need to have a concave portion for the invention to operate. The conduit box bottom wall 36 can be of any shape that allows the conduit box 22 to be attached to the motor shell 22 and compress a gasket 50 positioned between the conduit box 24 and the motor shell 22. When the conduit box bottom wall 36 has a portion 48 that is concave and the motor shell 22 is cylindrical, the conduit box 24 may be attached to the motor shell 22 in two distinct orientations 180 degrees apart. For example, the conduit box 24 shown in figure 1 may be removed from the motor shell 22 and rotated 180 degrees and attached to the motor shell 22 so that the conduit box power source opening 46 is oriented toward the back end 28 of the electric motor 20. In this orientation, the concave

portion 48 of the conduit box bottom wall 36 will still be complementary to the cylindrical motor shell 22.

The gasket of the invention 50 is similar to the prior art gaskets in that it is generally rectangular and has a narrow thickness between opposite first and second surfaces 52, 54 of the gasket. The gasket 50 has a lead opening 56 that extends through the gasket first and second surfaces 52, 54 for passage of the motor leads 32 through the gasket 50. A number of fastener holes 57 corresponding to the number of fastener holes in the conduit box and motor shell pass through the gasket. However, the gasket of the invention differs from gaskets of the prior art in that it includes a wall 58 that projects outwardly from the gasket first surface 52 and surrounds the gasket lead opening 56. The gasket wall 58 defines a cavity 60 within the gasket wall 58 adjacent to the gasket lead opening 56.

The gasket 50 is positioned on the motor shell 22 between the motor shell 22 and the conduit box 24 with the gasket first surface 52 against the conduit box 24 and the gasket second surface 54 against the motor shell 22. The gasket lead opening 56 is aligned with both the motor shell lead opening 34 and the conduit box lead opening 44. The gasket fastener holes 57 are aligned with the conduit box fastener holes 45 and the fastener holes of the motor shell (not shown). The gasket 50 is further positioned on the motor shell 22 so that the motor leads 32 pass through the gasket lead opening 56 and into the conduit box interior 42 through the conduit box lead opening 44. Threaded fasteners are inserted through the fastener holes of the conduit box, the gasket and the motor shell and secure the conduit box to the motor shell with the gasket therebetween.

Preferably, the gasket 50 is made from a compressible and resilient material such as rubber or the like. The gasket 50 is compressed when the conduit box 24 is attached to the motor shell 22 by the threaded fasteners. The compression of the gasket 50 causes the gasket 50 to form a liquid tight seal between the conduit box 24 and the motor shell 22. The liquid tight seal formed by the gasket 50 between conduit box 24 and the motor shell 22 prevents liquids on the exterior of the conduit box 24 and the motor shell 22

from entering the conduit box 24 or the electric motor 20 through the respective conduit box lead opening 44 and the motor shell lead opening 34. While the gasket 50 is preferably made from a resilient and compressible material, it should be understood that the gasket 50 may be made out of any material that is capable of forming a liquid tight seal between the conduit box

5 24 and the motor shell 22.

A sealant 62 is inserted into the gasket cavity 60. The sealant 62 surrounds the motor leads 32 passing through the gasket lead opening 56 and seals closed the gasket lead opening 56. Preferably, the sealant is an epoxy, however, it should be understood that any sealant that is capable of forming a liquid tight seal may be used. The gasket wall 58 retains the sealant 62 within the gasket cavity 60 and prevents the sealant 62 from coming in contact with and adhering to the conduit box 24. Because the sealant 62 is prevented from contacting and adhering to the conduit box 24,

10 15 the conduit box 24 can be removed from the motor shell 22 and reattached to the motor shell 22 in the same or a different orientation without breaking the seal formed by the sealant 62. In addition, because the gasket wall 58 retains the sealant 62 within the gasket cavity in the area around the gasket lead opening 56 and around the motor leads 32 where it is needed, it prevents the over application of sealant 62 inside the conduit box. This enables a metered amount of sealant to be dispensed in sealing the gasket lead opening in assembling motors on a production line.

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Preferably, the gasket lead opening 56 has a peripheral edge 64 that is dimensioned so that the gasket peripheral edge 64 is stretched when the motor leads 32 are passed through the gasket lead opening 56. The gasket peripheral edge 64 holds the motor leads 32 tightly together and secures the motor leads 32 within the gasket lead opening 56. Preferably, the tight fit between the gasket peripheral edge 64 and the motor leads 32 helps to prevent the sealant 62 from flowing through the gasket lead opening 56 and into the motor shell 22 prior to the sealant 62 curing.

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Preferably, the conduit box lead opening 44 is an annular lead opening, and the gasket wall 58 is an annular gasket wall. However, it should be

understood that the conduit box lead opening 44 and the gasket wall 58 may be of any shape as long as the shapes allow the conduit box 24 to be removed from and reattached to the motor shell 22 in the same or alternate orientations without breaking the seal formed by the sealant 62 in the gasket cavity 60.

The gasket wall 58 and the conduit box lead opening 44 are dimensioned so that the gasket wall 58 is not constricted by the conduit box lead opening 44 so that the conduit box 58 may be easily removed from and attached to the motor shell 22. Preferably, the gasket wall 58 has an outer peripheral edge 66 with an outer diameter that is less than an inner diameter of the conduit box lead opening 44 so that a gap 68 exists between the gasket wall outer peripheral edge 66 and the conduit box lead opening 44. However, it should be understood that the fit between the gasket wall 58 and the conduit box lead opening 44 is not critical to the operation of the invention as long as the conduit box 24 can be removed from and reattached to the motor shell 22 in the same or different orientations without breaking the seal formed by the sealant 62 in the gasket cavity 60.

The gasket wall 58 projects outwardly from the gasket first surface 52 a distance that enables the gasket wall 58 to extend into the conduit box lead opening 44. Preferably, the gasket 58 projects outwardly from the gasket first surface 52 a distance that enables the gasket wall 58 to extend past the conduit box bottom wall 36 and into the conduit box interior 42. However, it should be understood that the distance the gasket wall 58 projects outwardly from the gasket first surface 52 is not critical to the operation of the gasket so long at the gasket wall 58 forms a gasket cavity 60 that is large enough to retain enough sealant 62 to seal closed the gasket lead opening 56.

The method of sealing the motor shell lead opening 34 and the conduit box lead opening 44 with the gasket 50 of the invention involves first placing the second surface 54 of the gasket 50 on the motor shell 22 so that the gasket lead opening 56 is aligned with the motor shell lead opening 34. As the gasket is positioned against the motor shell 22 the motor leads 32 are passed through the gasket lead opening 56. The gasket is positioned on the

motor shell 22 with its fastener holes 57 aligned with the motor shell fastener holes (not shown). The motor leads 32 are then passed through the conduit box lead opening 44 and the conduit box 24 is positioned against the motor shell 22 with the gasket 50 between the conduit box 24 and the motor shell 22. The conduit box lead opening 44 is aligned with the gasket lead opening 56 and the conduit box fastener holes 45 are aligned with the gasket fastener holes 57 and the motor shell fastener holes. The threaded fasteners are then inserted through the aligned fastener holes and tightened down, securing the conduit box to the motor with the gasket 50 compressed therebetween and with the motor leads 32 passed through the conduit box lead opening 44 and into the conduit box interior 42. The sealant 62 is then applied in the gasket cavity 60 so that the sealant forms a liquid tight seal between the motor leads 32 and the gasket wall 58 and seals closed the gasket lead opening 56. Because the gasket wall 58 prevents the sealant 62 from contacting and adhering to the conduit box 24, the conduit box 24 can be removed from and reattached to the motor shell 22 in the same or a different orientation without breaking the seal formed by the sealant 62 in the gasket cavity 60.

While the present invention has been described by reference to a specific embodiment, it should be understood that modifications and variations of the invention may be constructed without departing from the scope of the invention as defined by the following claims. For example, the seal may be employed between a housing electrical lead opening and any other type of lead enclosure and not necessarily a conduit box. Also, the gasket wall could be positioned extending into the motor shell lead opening instead of the conduit box lead opening.